

WHAT IS CLAIMED IS:

1 1. A clutch controller of a mechanical automatic
2 transmission which enables automatic transmission
3 operation by means of providing a transmission gear
4 mechanism with an actuator and a clutch mechanism
5 with an actuator, the controller comprising:
6 engine speed detection means for detecting an
7 engine speed;
8 accelerator position detection means for
9 detecting the position of an accelerator;
10 range setting means for setting an engine speed
11 range in which engine output torque falls within a
12 predetermined range including a maximum value at the
13 position of said accelerator detected by said
14 accelerator position detection means; and
15 control means which effects direct engagement
16 of a clutch when a vehicle is pulled away while
17 controlling a connected state of said clutch such that
18 the engine speed detected by said engine speed
19 detection means falls within said engine speed range
20 set by said range setting means.

1 2. The clutch controller of the mechanical
2 automatic transmission according to claim 1, wherein
3 said range setting means sets a first threshold value
4 at an engine speed lower than an engine speed at which

5 said engine output torque becomes maximum at said
6 position of said accelerator and sets a second
7 threshold value at an engine speed higher than said
8 engine speed, thereby setting said engine speed range.

1 3. The clutch controller of the mechanical
2 automatic transmission according to claim 2, wherein
3 said first threshold value and said second threshold
4 value are set in accordance with said position of said
5 accelerator.

1 4. The clutch controller of the mechanical
2 automatic transmission according to claim 2, wherein
3 said control means comprises
4 a storage section for storing a map in which
5 clutch stroke speeds corresponding to a rate of change
6 in said engine speed are set with regard to three
7 ranges; namely, a first range which is lower in engine
8 speed than said first threshold value, a second range
9 falling between said first threshold value and said
10 second threshold value, and a third range higher in
11 engine speed than said second threshold value;
12 a determination section for determining which
13 one of said three ranges that said engine speed detected
14 by said engine speed detection means falls within;
15 and
16 a clutch control section which selects from said

17 map a clutch stroke speed corresponding to the range
18 determined by said determination section and controls
19 said clutch stroke speed of said clutch.

1 5. The clutch controller of the mechanical
2 automatic transmission defined in claim 4, wherein
3 said storage section stores, as said map, control lines
4 corresponding to said three ranges on coordinates
5 formed from the rate of change in said engine speed
6 and said clutch stroke speed;

7 said control line of the second range is set so
8 as to increase said clutch stroke speed in a clutch
9 engagement direction when the rate of change in said
10 engine speed has increased and to increase said clutch
11 stroke speed in a clutch disengagement direction when
12 the rate of said engine speed has decreased; and

13 said control line of said first range is a line
14 obtained as a result of said control line in said second
15 range having been shifted toward an increase in the
16 rate of change in said engine speed, and said control
17 line of said third range is a line obtained as a result
18 of said control line of said second range having been
19 shifted toward a decrease in the rate of change in
20 said engine speed.

1 6. The clutch controller of the mechanical
2 automatic transmission defined in claim 4, wherein

3 said storage section stores a map in which are
4 set clutch stroke speeds corresponding to the rate
5 of change in said engine speed in connection with a
6 plurality of ranges into which said first range has
7 been divided;

8 said determination section determines which one
9 of said plurality of ranges within said first range
10 includes said engine speed detected by said engine
11 speed detection means when said detected engine speed
12 falls within said first range; and

13 said clutch control section controls said clutch
14 stroke speed of said clutch by means of selecting,
15 from said map, a clutch stroke speed corresponding
16 to said range determined by said determination
17 section.

1 7. The clutch controller of the mechanical
2 automatic transmission defined in claim 6, wherein
3 said storage section stores, as said map, sub-control
4 lines corresponding to said plurality of ranges within
5 said first range on coordinates formed from the rate
6 of change in engine speed and said clutch stroke speed;
7 and

8 said sub-control lines assigned to said
9 plurality of ranges within said first range are formed
10 by shifting at intervals said control line of said
11 second range toward an increase in the rate of said

12 engine speed.

1 8. The clutch controller of the mechanical
2 automatic transmission defined in claim 4, wherein
3 said storage section stores a map in which are
4 set clutch stroke speeds corresponding to the rate
5 of change in said engine speed in connection with a
6 plurality of ranges into which said third range has
7 been divided;

8 said determination section determines which one
9 of said plurality of ranges within said third range
10 includes said engine speed detected by said engine
11 speed detection means when said detected engine speed
12 falls within said third range; and

13 said clutch control section controls said clutch
14 stroke speed of said clutch by means of selecting,
15 from said map, a clutch stroke speed corresponding
16 to said range determined by said determination
17 section.

1 9. The clutch controller of the mechanical
2 automatic transmission defined in claim 6, wherein
3 said storage section stores a map in which are
4 set clutch stroke speeds corresponding to the rate
5 of change in said engine speed in connection with a
6 plurality of ranges into which said third range has
7 been divided;

8 said determination section determines which one
9 of said plurality of ranges within said third range
10 includes said engine speed detected by said engine
11 speed detection means when said detected engine speed
12 falls within said third range; and

13 said clutch control section controls said clutch
14 stroke speed of said clutch by means of selecting,
15 from said map, a clutch stroke speed corresponding
16 to said range determined by said determination
17 section.

1 10. The clutch controller of the mechanical
2 automatic transmission defined in claim 8, wherein
3 said storage section stores, as said map, sub-control
4 lines corresponding to said plurality of ranges within
5 said third range on coordinates formed from the rate
6 of change in engine speed and said clutch stroke speed;
7 and

8 said sub-control lines assigned to said
9 plurality of ranges within said third range are formed
10 by shifting at intervals said control line of said
11 second range toward a decrease in the rate of said
12 engine speed.

1 11. The clutch controller of the mechanical
2 automatic transmission defined in claim 9, wherein
3 said storage section stores, as said map, sub-control

4 lines corresponding to said plurality of ranges within
5 said third range on coordinates formed from the rate
6 of change in engine speed and said clutch stroke speed;
7 and
8 said sub-control lines assigned to said
9 plurality of ranges within said third range are formed
10 by shifting at intervals said control line of said
11 second range toward a decrease in the rate of said
12 engine speed.

1 12. A method for controlling a clutch of a
2 mechanical automatic transmission which enables
3 automatic transmission operation by means of
4 providing a transmission gear mechanism with an
5 actuator and a clutch mechanism with an actuator, the
6 method comprising the steps of:
7 detecting an engine speed and the position of
8 an accelerator;
9 setting a first threshold value at an engine speed
10 lower than an engine speed at which said engine output
11 torque becomes maximum at said detected position of
12 said accelerator and setting a second threshold value
13 at an engine speed higher than said engine speed; and
14 effecting direct engagement of said clutch while
15 controlling a connected state of said clutch such that
16 said detected engine speed falls between said set first
17 threshold value and said second threshold value.

1 13. The method for controlling a clutch of a
2 mechanical automatic transmission according to claim
3 12, wherein, when said detected engine speed is lower
4 than said first threshold value, said clutch is
5 controlled so as to be disengaged; and, when said
6 detected engine speed is higher than said second
7 threshold value, said clutch is controlled so as to
8 be engaged.

1 14. The method for controlling a clutch of a
2 mechanical automatic transmission according to claim
3 12, wherein a low engine speed sub-threshold value
4 is set at an engine speed which is lower than said
5 first threshold value; and, when said detected engine
6 speed is lower than said engine speed sub-threshold
7 value, a clutch stroke speed is increased toward said
8 clutch disengagement direction as compared with a case
9 where said detected engine speed falls between said
10 first threshold value and said low engine speed
11 sub-threshold value.

1 15. The method for controlling a clutch of a
2 mechanical automatic transmission according to claim
3 14, wherein a plurality of said low engine speed
4 sub-threshold values are set at engine speeds lower
5 than said first threshold value; and, when said

6 detected engine speed falls between an $(n+1)^{\text{th}}$ (n ;
7 natural number) low engine speed sub-threshold value
8 and an $(n+2)^{\text{th}}$ low engine speed sub-threshold value
9 toward a lower engine speed from said first threshold
10 value, said clutch stroke speed is increased toward
11 said clutch disengagement direction as compared with
12 a case where said detected engine speed falls between
13 an n^{th} low engine speed sub-threshold value and said
14 $(n+1)^{\text{th}}$ low engine speed sub-threshold value.

1 16. The method for controlling a clutch of a
2 mechanical automatic transmission according to claim
3 12, wherein a high engine speed sub-threshold value
4 is set at an engine speed higher than said second
5 threshold value; and, when said detected engine speed
6 is higher than said high engine speed sub-threshold
7 value, said clutch stroke speed is increased toward
8 said clutch engagement direction as compared with a
9 case where said detected engine speed falls between
10 said first threshold value and said high engine speed
11 sub-threshold value.

1 17. The method for controlling a clutch of a
2 mechanical automatic transmission according to claim
3 14, wherein a high engine speed sub-threshold value
4 is set at an engine speed higher than said second
5 threshold value; and, when said detected engine speed

6 is higher than said high engine speed sub-threshold
7 value, said clutch stroke speed is increased toward
8 said clutch engagement direction as compared with a
9 case where said detected engine speed falls between
10 said first threshold value and said high engine speed
11 sub-threshold value.

1 18. The method for controlling a clutch of a
2 mechanical automatic transmission according to claim
3 16, wherein a plurality of said high engine speed
4 sub-threshold values are set at engine speeds higher
5 than said first threshold value; and, when said
6 detected engine speed falls between an $(n+1)^{\text{th}}$ (n ;
7 natural number) high engine speed sub-threshold value
8 and an $(n+2)^{\text{th}}$ high engine speed sub-threshold value
9 toward a higher engine speed from said first threshold
10 value, said clutch stroke speed is increased toward
11 said clutch engagement direction as compared with a
12 case where said detected engine speed falls between
13 an n^{th} high engine speed sub-threshold value and said
14 $(n+1)^{\text{th}}$ high engine speed sub-threshold value.

1 19. The method for controlling a clutch of a
2 mechanical automatic transmission according to claim
3 17, wherein a plurality of said high engine speed
4 sub-threshold values are set at engine speeds higher
5 than said first threshold value; and, when said

6 detected engine speed falls between an $(n+1)^{\text{th}}$ (n ;
7 natural number) high engine speed sub-threshold value
8 and an $(n+2)^{\text{th}}$ high engine speed sub-threshold value
9 toward a higher engine speed from said first threshold
10 value, said clutch stroke speed is increased toward
11 said clutch engagement direction as compared with a
12 case where said detected engine speed falls between
13 an n^{th} high engine speed sub-threshold value and said
14 $(n+1)^{\text{th}}$ high engine speed sub-threshold value.
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